

Sandia National Laboratories, New Mexico

Environmental Restoration Operations

A U.S. Department of Energy Environmental Cleanup Program

Consolidated Quarterly Report

April – June 2017



October 2017



United States Department of Energy
Sandia Field Office

CONSOLIDATED QUARTERLY REPORT

October 2017

SANDIA NATIONAL LABORATORIES, NEW MEXICO

ENVIRONMENTAL RESTORATION OPERATIONS

U.S. DEPARTMENT OF ENERGY:
CONTRACTOR:

SANDIA FIELD OFFICE
NATIONAL TECHNOLOGY AND
ENGINEERING SOLUTIONS OF SANDIA
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PROJECT MANAGER:

NUMBER OF POTENTIAL RELEASE SITES SUBJECT TO CORRECTIVE ACTION: 12

SUSPECT WASTE: Radionuclides, metals, organic compounds, and explosives

REPORTING PERIOD: April – June 2017

OVERVIEW

This Sandia National Laboratories, New Mexico Environmental Restoration Operations (ER) Consolidated Quarterly Report (ER Quarterly Report) fulfills all quarterly reporting requirements set forth in the Compliance Order on Consent. The 12 sites in the corrective action process are listed in Table I-1. This ER Quarterly Report presents activities and data in sections as follows:

SECTION I: Environmental Restoration Operations Consolidated Quarterly Report,
April – June 2017

SECTION II: Perchlorate Screening Quarterly Groundwater Monitoring Report,
April – June 2017

ABBREVIATIONS AND ACRONYMS

µg/L	microgram(s) per liter
µmhos/cm	micromhos per centimeter
°C	degrees Celsius
% Sat	percent saturation
AGMR	Annual Groundwater Monitoring Report
AOC	Area of Concern
AR/COC	Analysis Request/Chain-of-Custody
AVN	Area V (North)
BSG	Burn Site Groundwater
BW	background well
CAC	corrective action complete
CCBA	Coyote Canyon Blast Area
CFR	Code of Federal Regulations
CME	Corrective Measures Evaluation
COA	certificates of analyses
COC	constituent of concern
the Consent Order	Compliance Order on Consent
CTF	Coyote Test Field
CY	Calendar Year
CYN	Canyons (Burn Site Groundwater Area of Concern)
DO	dissolved oxygen
DOE	U.S. Department of Energy
DP-1845	Discharge Permit-1845
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration Operations
ER Quarterly Report	Environmental Restoration Operations (ER) Consolidated Quarterly Report
FOP	Field Operating Procedure
GEL	GEL Laboratories LLC
GWQB	Ground Water Quality Bureau
HQ	hazard quotient
HWB	Hazardous Waste Bureau
ISB	in-situ bioremediation
LWDS	liquid waste disposal system
MCL	maximum contaminant level
MDL	method detection limit
mg/L	milligrams per liter
MRN	Magazine Road North

mV	millivolts
MW	monitoring well
MWL	Mixed Waste Landfill
NA	not applicable
ND	nondetect
NE	not established
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
NTU	nephelometric turbidity unit
NWTA	Northwest Technical Area (-III)
OBS	Old Burn Site
ORP	oxidation-reduction potential
PGS	Parade Ground South
pH	potential of hydrogen (negative logarithm of the hydrogen ion concentration)
PQL	practical quantitation limit
QC	quality control
SAP	sampling and analysis plan
SC	specific conductivity
SNL/NM	Sandia National Laboratories, New Mexico
SWMU	Solid Waste Management Unit
SWTA	Southwest Technical Area (-III)
TA	Technical Area
TA1-W	Technical Area-I (Well)
TA2-NW	Technical Area-II (Northwest)
TA2-SW	Technical Area-II (Southwest)
TA2-W	Technical Area-II (Well)
TAG	Tijeras Arroyo Groundwater
TAV	Technical Area-V (acronym used for well identification numbers in tables only)
TA-V	Technical Area-V
TAVG	Technical Area-V Groundwater
TBD	to be determined
TCE	trichloroethene
TJA	Tijeras Arroyo (acronym used for well identification numbers in tables only)
TS/IM	Treatability Study/Interim Measure
TSWP	Treatability Study Work Plan
WYO	Wyoming

SECTION I

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SECTION I

ENVIRONMENTAL RESTORATION OPERATIONS CONSOLIDATED

QUARTERLY REPORT, April – June 2017

1.0 Introduction

This Environmental Restoration Operations (ER) Consolidated Quarterly Report (ER Quarterly Report) provides the status of ongoing corrective action activities being implemented at Sandia National Laboratories, New Mexico (SNL/NM) during the April, May, and June 2017 quarterly reporting period.

Table I-1 lists the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) identified for corrective action at SNL/NM. Sections I.2.1 and I.2.2 summarize the work completed during this quarter. Section I.2.1 summarizes the quarterly activities at sites undergoing corrective action *field* activities. Field activities are conducted at the three groundwater AOCs (Burn Site Groundwater [BSG AOC], Technical Area [TA]-V Groundwater [TAVG AOC], and Tijeras Arroyo Groundwater [TAG AOC]). Section I.2.2 summarizes quarterly activities at sites where the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) issued a certificate of completion and the sites are in the corrective action complete (CAC) *regulatory* process. Currently, SWMUs 8 and 58, 68, 149, 154, and 502 are in the CAC regulatory process.

Corrective action activities are deferred at the Long Sled Track (SWMU 83), the Gun Facilities (SWMU 84), and the Short Sled Track (SWMU 240) because these three sites are active mission facilities. These three active mission sites are located in TA-III.

2.0 Environmental Restoration Operations Work Completed

The following subsections describe the environmental restoration operations work completed during the second quarter 2017.

2.1 Sites Undergoing Corrective Action

In a letter dated April 14, 2016, the NMED HWB defined the scope and milestones for corrective action at three groundwater AOCs (BSG AOC, TAVG AOC, and TAG AOC)

(NMED April 2016). Sections 2.1.1 through 2.1.3 discuss the specific milestones from this letter.

2.1.1 Burn Site Groundwater Area of Concern

Nitrate has been identified as a constituent of concern (COC) in groundwater at the BSG AOC based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in samples collected from monitoring wells. The EPA MCL and State of New Mexico drinking water standard for nitrate is 10 milligrams per liter (mg/L) (as nitrogen).

The U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA) and SNL/NM personnel met with the NMED HWB on July 20, 2015 to discuss the status of sites currently undergoing corrective action. For the BSG AOC, all parties agreed to a weight-of-evidence characterization program: (1) to conduct additional isotopic analyses/nitrate fingerprinting and age-dating of the groundwater; (2) to conduct a transducer study using existing wells to determine whether the groundwater is unconfined, semi-confined, or confined; and (3) to conduct an aquifer pumping test to help determine the origin of the elevated nitrates in the groundwater.

Semiannual sampling at the BSG AOC currently includes perchlorate analyses at one groundwater monitoring well.

The following activities occurred at BSG AOC during April, May, and June 2017:

- Groundwater sampling was conducted in April 2016. Table I-2 presents the identification and sampling frequency for these monitoring wells. The analytical results for Calendar Year (CY) 2017 groundwater monitoring will be presented in the SNL/NM CY 2017 Annual Groundwater Monitoring Report, which is anticipated to be submitted to the NMED in the summer of 2018.
- Perchlorate analysis of groundwater samples from the BSG AOC is discussed in Section II of this ER Quarterly Report.
- In support of the weight-of-evidence characterization, DOE/NNSA, SNL/NM, and NMED personnel met on May 10, 2017 to discuss the results of the Aquifer Pumping Test that was performed in March 2017.

2.1.2 **Technical Area-V Groundwater Area of Concern**

Trichloroethene (TCE) and nitrate have been identified as COCs in groundwater at the TAVG AOC based on detections above the EPA MCLs in samples collected from monitoring wells. The EPA MCLs and the State of New Mexico drinking water standards for TCE and nitrate are 5 micrograms per liter (µg/L) and 10 mg/L (as nitrogen), respectively.

Personnel from the DOE/NNSA, DOE Headquarters Office of Environmental Management, SNL/NM, and NMED HWB worked together to address the groundwater contamination at TAVG AOC. A meeting was held with the NMED HWB on July 20, 2015 and all parties agreed on a phased Treatability Study/Interim Measure (TS/IM) of in-situ bioremediation (ISB) to evaluate the effectiveness of ISB as a potential technology to treat the groundwater contamination at TAVG AOC.

For the TS/IM, up to three injection wells (TAV-INJ1, TAV-INJ2, and TAV-INJ3) will be installed at TA-V in the vicinity of the highest contaminant concentrations in groundwater detected in monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10. The proposed injection wells will be used to deliver substrate solution and biodegradation bacteria to groundwater. The substrate solution containing essential food and nutrients for biostimulation will be prepared in aboveground tanks. The substrate solution, along with the biodegradation bacteria, will be gravity-injected to groundwater via injection wells.

The Revised Treatability Study Work Plan (TSWP) (SNL/NM March 2016) was approved by NMED HWB on May 10, 2016 (NMED May 2016). The Revised TSWP covers implementing the TS/IM of ISB at TAVG AOC and installation of two more groundwater monitoring wells (TAV-MW15 and TAV-MW16) south of the TA-V boundary (SNL/NM March 2016). These new wells will help define the extent of the TCE plume and the potentiometric surface along the southern boundary of TA-V. The installation of monitoring wells TAV-MW15 and TAV-MW16 was completed in March 2017. The TA-V groundwater monitoring network now comprises 18 active wells.

The following activities occurred at TAVG AOC during April, May, and June 2017:

- The well installation report for monitoring wells TAV-MW15 and TAV-MW16 was submitted to DOE/NNSA Sandia Field Office for transmittal to NMED HWB scheduled in July 2017.

- A Groundwater Discharge Permit is required for operation of the TA-V Treatability Study injection wells; therefore, a Discharge Permit Application was submitted to NMED Ground Water Quality Bureau (GWQB) in July 2016 (DOE July 2016). After DOE/NNSA and SNL/NM personnel fulfilled the public notice requirements for the Discharge Permit Application (DOE November 2016a), NMED GWQB released the draft Discharge Permit-1845, DP-1845, on March 3, 2017 for a 30-day public comment period (NMED March 2017). NMED GWQB extended the public comment period for an additional 30-day period that ended on May 11 (NMED April 2017). NMED GWQB issued DP-1845 to DOE/NNSA for SNL/NM TA-V Treatability Study injection wells on May 26, 2017 (NMED May 2017a). The DP-1845 term ends on May 26, 2022. SNL/NM personnel started preparatory work to install the first injection well TAV-INJ1, upon issuance of DP-1845.
- Groundwater sampling was conducted in May and June 2017. Starting CY 2017, DOE/NNSA and SNL/NM personnel are implementing a revised groundwater monitoring plan for TAVG AOC in accordance with the Revised TSWP (SNL/NM March 2016). Table I-2 presents the identification and the sampling frequency for the monitoring wells at TAVG AOC, including the two newly installed monitoring wells TAV-MW15 and TAV-MW16. The analytical results for CY 2017 groundwater monitoring will be presented in the SNL/NM CY 2017 Annual Groundwater Monitoring Report, which is anticipated to be submitted to the NMED HWB in the summer of 2018.
- No constituents were detected at concentrations exceeding the regulatory levels during the first sampling event conducted in February for the new monitoring wells TAV-MW15 and TAV-MW16.
- During the May and June groundwater sampling event, monitoring wells TAV-MW15 and TAV-MW16 we also sampled for perchlorate in accordance with the Compliance Order on Consent (NMED April 2004). This is the second of the four quarterly perchlorate sampling events required for the newly-installed groundwater monitoring wells. Section II presents perchlorate results.

2.1.3 **Tijeras Arroyo Groundwater Area of Concern**

Nitrate has been identified as a COC in groundwater for the TAG AOC based on detections above the EPA MCL in samples collected from monitoring wells completed in the Perched Groundwater System and in the Regional Aquifer. TCE has been identified as a COC for the

Perched Groundwater System. However, the area where TCE exceedances occurred has naturally dewatered and the last reported TCE concentration was 3.82 µg/L, occurring in November 2015, which is less than the EPA MCL of 5 µg/L (SNL/NM June 2016). No TCE concentrations in Regional Aquifer samples have exceeded the MCL. The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate are 5 µg/L and 10 mg/L (as nitrogen), respectively.

In May 2017, NMED HWB completed its review of the Current Conceptual Model and Corrective Measures Evaluation Report for the TAG AOC (SNL/NM December 2016), which was submitted to NMED HWB on November 23, 2016 (DOE November 2016b). The report was submitted in accordance with NMED's "Agreements and Proposed Milestones" letter of April 14, 2016 (NMED April 2016). NMED's disapproval letter (NMED May 2017b) requested additional information for the report with a response due on or before November 30, 2017.

The following activities occurred at TAG AOC during April, May, and June 2017:

- Groundwater sampling at the TAG AOC was conducted in June 2017. Table I-2 presents the identification and the sampling frequency for these monitoring wells. The analytical results for CY 2017 groundwater monitoring will be presented in the SNL/NM CY 2017 Annual Groundwater Monitoring Report, which is anticipated to be submitted to the NMED HWB in the summer of 2018.

2.2 Sites in Corrective Action Complete Regulatory Process

After NMED HWB certifies completion of corrective action activities at a SWMU or an AOC, a Class 3 Modification to the Permit is requested by DOE/NNSA to formally change the status of the SWMU or AOC from Corrective Action Required to either CAC without Controls or CAC with Controls. The Class 3 Permit Modification is a regulatory process.

2.2.1 Solid Waste Management Units 8 and 58, 68, 149, and 154

In February 2015, NMED HWB agreed that corrective action activities at SWMUs 8 and 58, 68, 149, and 154 had been completed, and that certificates of completion could be requested (NMED February 2015). A letter requesting certificates of completion for these SWMUs was submitted to the NMED HWB on September 4, 2015 (DOE September 2015). In January 2016, NMED HWB granted the certificates of completion for these SWMUs (NMED January 2016). Section I.2.2.3 describes the Class 3 Permit Modification request for

CAC status, which was prepared and submitted to the NMED HWB on May 16, 2016 (DOE May 2016).

2.2.2 **Solid Waste Management Unit 502**

On February 29, 2016, the NMED HWB approved the November 2013 SWMU 502 Voluntary Corrective Action Report and noted that a permit modification for CAC status for SWMU 502 may be requested (NMED February 2016). Section I.2.2.3 describes the Class 3 Permit Modification request for CAC status, which was prepared and submitted to the NMED HWB on May 16, 2016 (DOE May 2016).

2.2.3 **Class 3 Permit Modification Request**

A Class 3 Permit Modification to designate six SWMUs as approved for CAC status (DOE May 2016) was requested in a letter dated May 16, 2016. The following SWMUs were included in the request:

- SWMU 8 Open Dump (Coyote Canyon Blast Area)
- SWMU 58 Coyote Canyon Blast Area
- SWMU 68 Old Burn Site
- SWMU 149 Building 9930 Septic System (Coyote Test Field)
- SWMU 154 Building 9960 Septic System and Seepage Pits (Coyote Test Field)
- SWMU 502 Building 9938 Surface Discharge Site

The DOE/NNSA and SNL/NM personnel held a 60-day public comment period from May 25 through July 24, 2016 and hosted a public meeting with information about the SWMUs on June 21, 2016. Information about the public notices, public meeting, meeting attendance list, and summary information about the six SWMUs was provided to the NMED HWB in a letter transmitted on September 8, 2016 (DOE September 2016). The Class 3 Permit Modification process is ongoing, and NMED is reviewing the Class 3 Permit Modification Request.

3.0 References

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New Mexico Environment Department (NMED), March 2017. Draft Ground Water Discharge Permit, Sandia National Laboratories/New Mexico, Discharge Permit-1845, <https://cloud.env.nm.gov/water/resources/translator.php/3wdGf2YvWP7JR8htsQErkMxbvE56mnoqDRp2BQAIXXbigeEtSCEhgT9cBlqLEUu1/EFByl4kPzyL7Ef7vI9VSCa+7+vnjhZ1yev7hDmQZ/AZE2JleTMw5gqapMkeI9n8osMNnw1flrU=.pdf>, NMED, Ground Water Quality Bureau, Santa Fe, New Mexico, March 3, 2017.

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U.S. Department of Energy (DOE), November 2016b. Letter to J.E. Kieling (New Mexico Environment Department), “Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report, December 2016,” November 23, 2016.

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Tables

Table I-1
Solid Waste Management Units and Areas of Concern
Where Corrective Action is Not Complete

Solid Waste Management Units and Areas of Concern	
Site Number	Site Description
8	Open Dump (CCBA)
58	CCBA
68	Old Burn Site
83	Long Sled Track
84	Gun Facilities
149	Building 9930 Septic System (CTF)
154	Building 9960 Septic System and Seepage Pits (CTF)
240	Short Sled Track
NA	Tijeras Arroyo Groundwater Investigation (TAG AOC)
NA	TA-V Groundwater Investigation (TAVG AOC)
NA	Burn Site Groundwater Investigation (BSG AOC)
502	Building 9938 Surface Discharge Site
Total	12

Notes

AOC = Area of Concern.
BSG = Burn Site Groundwater.
CCBA = Coyote Canyon Blast Area.
CTF = Coyote Test Field.
NA = Not applicable. A site number was not assigned.
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.
TA-V = Technical Area-V.
TAVG = Technical Area-V Groundwater.

Table I-2
Groundwater Sampling and Analysis

Investigation Site	Sampling Frequency in CY 2017	Quarter of Sampling in CY 2017	Location of Analytical Results	Location of Perchlorate Analytical Results	Monitoring Wells in Network
TAVG AOC	Quarterly	1,2,3,4	AGMR	Section II of ER Consolidated Quarterly Report	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW6, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, TAV-MW16
	Semiannually	2,4	AGMR	NA	TAV-MW7
	Annually	2	AGMR	NA	AVN-1, LWDS-MW2, TAV-MW3, TAV-MW5, TAV-MW9, TAV-MW13
BSG AOC	Semiannually	2,4	AGMR	Section II of ER Consolidated Quarterly Report	CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, CYN-MW15
TAG AOC	Quarterly	1,2,3,4	AGMR	NA	TA2-W-19, TA2-W-26, TA2-W-28, TJA-2, TJA-3, TJA-4, TJA-7, WYO-4
	Semiannually	1,3	AGMR	NA	TA1-W-06, TA2-W-01, TA2-W-27, TJA-6
	Annually	3	AGMR	NA	PGS-2, TA1-W-01, TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-08, TA2-NW1-595, WYO-3

Notes

AGMR = Annual Groundwater Monitoring Report.
 AOC = Area of Concern.
 AVN = Area V (North).
 BSG = Burn Site Groundwater (Area of Concern).
 CY = Calendar Year.
 CYN = Canyons (Burn Site Groundwater Area of Concern).
 ER = Environmental Restoration Operations.
 LWDS = liquid waste disposal system.
 MW = monitoring well.
 NA = not applicable. No wells in the site network are currently being sampled and analyzed for perchlorate.
 PGS = Parade Ground South.
 TA1-W = Technical Area-I (Well).
 TA2-NW = Technical Area-II (Northwest).
 TA2-W = Technical Area-II (Well).
 TAG = Tijeras Arroyo Groundwater (Area of Concern).
 TAV = Technical Area-V (acronym used for well identification numbers only).
 TAVG = Technical Area-V Groundwater (Area of Concern).
 TJA = Tijeras Arroyo.
 WYO = Wyoming.

SECTION II

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SECTION II

PERCHLORATE SCREENING QUARTERLY GROUNDWATER MONITORING REPORT, April – June 2017

1.0 Introduction

Section IV.B of the Compliance Order on Consent (the Consent Order), between the New Mexico Environment Department (NMED), the U.S. Department of Energy (DOE), and Sandia National Laboratories, New Mexico (SNL/NM), effective on April 29, 2004, stipulates that a select group of groundwater monitoring wells at SNL/NM be sampled for perchlorate (NMED April 2004). This section of the Environmental Restoration Operations (ER) Consolidated Quarterly Report (ER Quarterly Report) summarizes the perchlorate screening groundwater monitoring completed during the second quarter of calendar year (CY) 2017 (April, May, and June 2017) in response to the requirements of the Consent Order. The outline of this report is based on the required elements of a “Periodic Monitoring Report” described in Section X.D. of the Consent Order (NMED April 2004).

In November 2005, DOE/National Nuclear Security Administration (NNSA) and SNL/NM personnel submitted a letter report on the status of perchlorate screening in groundwater at SNL/NM monitoring wells (SNL/NM November 2005). The letter report summarized previous correspondence and sampling results and outlined proposed future work to comply with NMED requirements for perchlorate screening of groundwater. As specified in the letter report, quarterly reports are submitted for wells active in the perchlorate screening monitoring well network.

Based on the NMED response (NMED January 2006), DOE/NNSA and SNL/NM personnel submit each quarterly report within 90 days following the quarter that the data represent. In November 2008, DOE/NNSA and SNL/NM personnel received approval from the NMED to proceed to semiannual reporting (NMED November 2008); however, upon further consideration, the NMED once more required quarterly reporting (NMED April 2009). This did not alter the previously negotiated frequency for monitoring well CYN-MW6, an existing Burn Site Groundwater (BSG) Area of Concern (AOC) monitoring well that has been under the sampling and reporting requirements of the Consent Order since the well was installed, which remains at a semiannual frequency for sampling and reporting. Due to declining water levels, CYN-MW6 has insufficient water to routinely sample and the replacement monitoring well (CYN-MW15) was installed in December 2014; the negotiated semiannual sampling frequency transferred to this well.

In September 2011, DOE/NNSA and SNL/NM personnel requested an extension of the submittal dates by one month for ER Quarterly Reports (SNL/NM September 2011). The request was approved by the NMED (September 2011), which allows DOE/NNSA and SNL/NM personnel to submit perchlorate quarterly reports within 120 days following the quarter that the data represent.

This report is the forty-third perchlorate screening quarterly report to be submitted since the November 2005 letter report; the previous reports were submitted for fourth quarter of CY 2005 through the first quarter of CY 2017 (SNL/NM February 2006 and June 2017a).

Groundwater at BSG AOC monitoring well CYN-MW15 was sampled semiannually and was sampled for the sixth time during the reporting period (Table II-1). The corresponding reporting will continue for as long as a well remains active in the perchlorate screening network, or unless otherwise negotiated with the NMED.

2.0 **Scope of Activities**

This report provides second quarter of CY 2017 (April, May, and June 2017) perchlorate screening groundwater monitoring analytical results for the wells currently active in the perchlorate screening program as shown on Figure II-1 and listed in Table II-1. In accordance with the requirements of Table XI-1 of the Consent Order, a well with four consecutive quarters of nondetects (NDs) for perchlorate at the screening level/method detection limit (MDL) of 4 micrograms per liter ($\mu\text{g/L}$) is removed from the requirement of continued monitoring for perchlorate.

Data for numerous wells identified in the Consent Order have satisfied this requirement; therefore, these wells have been removed from the perchlorate screening program. The perchlorate results for these wells have been provided in previous reports and are not discussed in this current report. Table II-2 includes wells discussed in previous perchlorate screening reports.

SNL/NM personnel performed groundwater sampling for perchlorate at monitoring wells CYN-MW15, TAV-MW15, and TAV-MW16 in April and May 2017 (Table II-1). Groundwater sampling activities were conducted in accordance with procedures outlined in the *Burn Site Groundwater Monitoring, Mini-SAP for Third Quarter, Fiscal Year 2017* (SNL/NM March 2017); and the *Technical Area-V Groundwater Monitoring, Mini-SAP for Third Quarter, Fiscal Year 2017* (SNL/NM April 2017).

As described in the Mini-Sampling and Analysis Plan (SAP), groundwater sampling was performed in accordance with current SNL/NM Environmental Management, Long-Term Stewardship Project Field Operating Procedures (FOPs). A portable Bennett™ groundwater sampling system was used to collect the groundwater samples. The sampling pump and tubing bundle were decontaminated prior to placement into the monitoring well in accordance with procedures described in FOP 05-03, “Groundwater Monitoring Equipment Decontamination” (SNL/NM January 2015a). The well was purged a minimum of one saturated screen volume before sampling in accordance with FOP 05-01, “Groundwater Monitoring Well Sampling and Field Analytical Measurements” (SNL/NM January 2015b). Field water quality measurements for turbidity, pH, temperature, specific conductivity (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were obtained from the well prior to collecting the groundwater sample. Groundwater temperature, SC, ORP, DO, and pH were measured with an YSI™ Model EXO1 water quality meter. Turbidity was measured with a HACH™ Model 2100Q turbidity meter. Purging continued until four stable measurements for turbidity, pH, temperature, and SC were obtained. Groundwater stability is considered acceptable when the following parameters are achieved:

- Turbidity measurements are less than 5 nephelometric turbidity units (NTUs), or within 10 percent for turbidity values greater than 5 NTUs.
- pH is within 0.1 units.
- Temperature is within 1.0 degree Celsius.
- SC is within 5 percent.

Field measurement logs documenting details of well purging and water quality measurements have been submitted to the SNL/NM Customer Funded Record Center.

The groundwater samples were submitted to GEL Laboratories LLC (GEL) for chemical analysis of perchlorate using U.S. Environmental Protection Agency (EPA) Method 314.0 (EPA November 1999). Table II-3 provides the sample identification, Analysis Request/Chain-of-Custody form number, and the associated groundwater investigation. The analytical report from GEL, including certificates of analyses (COA) (Appendix A), analytical methods, MDLs, practical quantitation limits, dates of analyses, and results of quality control (QC) analyses and data validation findings (Appendix B), have been submitted to the SNL/NM Customer Funded Record Center.

3.0 **Regulatory Criteria**

For a given monitoring well, four consecutive ND results using the screening level/MDL of 4 µg/L are considered by the NMED as evidence of the absence of perchlorate, such that additional monitoring for perchlorate in that well is not required. If perchlorate is detected using the screening level/MDL of 4 µg/L in a specific well, then monitoring will continue at that well at a frequency negotiated with the NMED. The Consent Order (NMED April 2004) also requires that for detections equal to or greater than 4 µg/L, DOE/NNSA and SNL/NM personnel will evaluate the nature and extent of perchlorate contamination and incorporate the results of this evaluation into a Corrective Measures Evaluation (CME), based on a screening level/MDL of 4 µg/L. Section VII.C of the Consent Order clarifies that the CME process will be initiated where there is a documented release to the environment, and where corrective measures are necessary to protect human health and the environment.

3.1 **Burn Site Groundwater Area of Concern**

In March 2007, NMED sent a letter of approval, which required DOE/NNSA and SNL/NM personnel to “determine the nature and extent of the contamination and complete a CME for the perchlorate-impacted groundwater in the vicinity of CYN-MW6” (NMED March 2007). As this was based solely on four quarters of monitoring results, DOE/Sandia submitted a letter to the NMED in April 2007 (SNL/NM April 2007) recommending further characterization through continued quarterly monitoring of monitoring well CYN-MW6 for four additional quarters, ending in December 2007, to ensure appropriate characterization of this well. In January 2008, DOE/NNSA and SNL/NM personnel requested a meeting with the NMED to discuss the need for continued monitoring or additional characterization work and, potentially, a CME.

In preparation for discussing the perchlorate-impacted groundwater in the vicinity of monitoring well CYN-MW6, and to show that the requirement “to determine the nature and extent of contamination” (NMED March 2007) had been met, DOE/NNSA and SNL/NM personnel provided supporting information to the NMED (SNL/NM March 2008). Perchlorate in surface soil has been characterized at several Solid Waste Management Units (SWMUs) in the study area (SNL/NM June 2006 and March 2008–Appendix C). Based on these data, DOE/NNSA and SNL/NM personnel consider the nature and extent of perchlorate in groundwater at the BSG AOC to be sufficiently characterized. Since 2004, groundwater samples from four other monitoring wells in the vicinity of the BSG AOC have been analyzed for perchlorate, including monitoring wells CYN-MW1D, CYN-MW5, CYN-MW7, and CYN-MW8. All wells were sampled for four quarters and all results were ND for perchlorate (SNL/NM March 2008–Appendix D).

In accordance with the requirements of Section VI.K.1.b of the Consent Order (NMED April 2004), a human health risk assessment has been performed to evaluate the potential for adverse health effects from the concentrations of perchlorate detected in monitoring well CYN-MW6 groundwater samples. The maximum perchlorate concentration to date of 8.93 µg/L was used in the risk assessment. The calculated hazard quotient (HQ) of 0.35 is less than the NMED target level of a hazard index (the sum of all HQs) of 1.0 (NMED June 2006, SNL/NM March 2008–Appendix E). For another point of comparison, NMED risk assessment guidance has a tap water standard for perchlorate of 13.8 µg/L (NMED March 2015); therefore, the historical maximum concentration detected is 35 percent less than the NMED tap water standard.

Because perchlorate concentrations in samples from monitoring well CYN-MW6 have exceeded the screening level, DOE/NNSA and SNL/NM personnel initiated a negotiation process with the NMED (SNL/NM March 2007) to determine the frequency of continued monitoring. In November 2008, DOE/NNSA and SNL/NM personnel received approval from the NMED to proceed with semiannual monitoring of perchlorate in monitoring well CYN-MW6 and proceed with semiannual reporting of all perchlorate results (NMED November 2008). Upon further consideration, the NMED once more required that DOE/NNSA and SNL/NM personnel resume quarterly reporting of perchlorate results with the exception of monitoring well CYN-MW6 (NMED April 2009). Due to declining water levels, CYN-MW6 has insufficient water to routinely sample and was replaced; the last sample collected at CYN-MW6 was on October 15, 2012. The replacement monitoring well (CYN-MW15) was installed in December 2014 and assumed the negotiated semiannual monitoring frequency. Monitoring well CYN-MW14A was also installed in December 2014; this well was considered to be a new monitoring well that requires quarterly sampling due to its deep screen interval.

In April 2009, NMED sent a letter that required DOE/NNSA and SNL/NM personnel to characterize the nature and extent of the perchlorate contamination in soil and groundwater in the BSG AOC (NMED April 2009). A characterization work plan was prepared and submitted to the NMED (SNL/NM November 2009), approved by the NMED (February 2010), and implemented in July 2010.

3.2 Tijeras Arroyo Groundwater and Technical Area-V Groundwater Areas of Concern

The April 2009 letter from the NMED to DOE/NNSA and SNL/NM personnel was not limited to the BSG AOC (NMED April 2009). In the April 2009 letter, the NMED had also requested that DOE/NNSA and SNL/NM personnel monitor perchlorate concentrations for a minimum of four quarters at five monitoring wells in the Tijeras Arroyo Groundwater (TAG) AOC and at four monitoring wells in the Technical Area-V Groundwater (TAVG)

AOC (NMED April 2009). All nine wells from these two AOCs have been sampled for four consecutive monitoring events with no perchlorate detections being reported; therefore, these nine wells have been removed from the perchlorate sampling list. A TAG monitoring well (TA2-SW1-320) was damaged and was replaced by well, TA2-W-28 in December 2014. The replacement well was installed for the purpose of monitoring the same depth interval as damaged well TA2-SW1-320. Because well TA2-SW1-320 was not one of the four TAG wells selected for perchlorate sampling, replacement well TA2-W-28 does not require perchlorate sampling. Two recently installed wells in the TAVG AOC (TAV-MW15 and TAV-MW16) are considered “new” wells and require at least four quarters of perchlorate analyses, and therefore are discussed in this report.

3.3 **March 2006 and January 2008 Permit Modification Requests**

During the first quarter of CY 2011, four monitoring wells were added to the perchlorate monitoring network based on the NMED letter of April 8, 2010 entitled, “Class 3 Permit Modification Requests for Granting Corrective Action Complete Status for 26 SWMUs/AOCs (Request of March 1, 2006) and 5 Other SWMUs/AOCs (Request of January 7, 2008), Sandia National Laboratories, EPA ID #NM5890110518 HWB-SNL-06-007 and HWB-SNL-08-001” (NMED April 2010). The sites and the corresponding requests are described in Section I.2.2 of this ER Quarterly Report. The NMED letter required work plans and groundwater monitoring at the following SWMUs:

- SWMU 8/58—Installation of at least two groundwater monitoring wells west of and near Features YY and OO, and submittal and approval of a work plan.
- SWMU 49—Annual sampling of existing monitoring well CYN-MW5.
- SWMU 68—Installation of monitoring wells near the burn pan and associated ditch/surface impoundments, and submittal and approval of a work plan.
- SWMU 116—Annual sampling of existing monitoring well CTF-MW1.
- SWMU 149—Submittal of a SAP, and quarterly sampling of existing monitoring well CTF-MW3 for a minimum of eight quarters.
- SWMU 154—Submittal of a SAP, and quarterly sampling of existing monitoring well CTF-MW2 for a minimum of eight quarters.

To fulfill the requirements of the April 2010 NMED letter, DOE/NNSA and SNL/NM personnel submitted a SAP for monitoring wells CTF-MW2 and CTF-MW3 (SNL/NM June 2010) that was subsequently approved with modifications by the NMED (December 2010). All of these wells have been sampled for the required number of monitoring events, with no perchlorate detections, and have since been removed from the perchlorate sampling list.

The NMED letter of April 8, 2010, also required work plans, installation of groundwater monitoring wells, and groundwater monitoring at the following SWMUs:

- SWMUs 8/58—Two groundwater monitoring wells must be installed (CCBA-MW1 and CCBA-MW2) and sampled quarterly for a minimum of eight quarters.
- SWMU 68—Three groundwater monitoring wells must be installed (OBS-MW1, OBS-MW2, and OBS-MW3) and sampled quarterly for a minimum of eight quarters.

To fulfill requirements of the April 2010 NMED letter, DOE/NNSA and SNL/NM personnel submitted SWMU 68 and SWMUs 8/58 Groundwater Characterization Work Plans that included a Well Installation Plan/SAP for monitoring wells CCBA-MW1, CCBA-MW2, OBS-MW1, OBS-MW2, and OBS-MW3 (SNL/NM September 2010) that was subsequently approved with modification by the NMED (January 2011). All of these wells have been sampled for eight or more consecutive monitoring events with no perchlorate detections and have since been removed from the perchlorate sampling list.

4.0 **Monitoring Results**

Table II-3 summarizes the details of samples collected from monitoring wells CYN-MW15, TAV-MW15, and TAV-MW16 in the second quarter of CY 2017. Table II-4 summarizes the current and historical perchlorate results for these three wells. Appendix A provides the analytical laboratory COA for the second quarter of CY 2017 perchlorate data. Perchlorate was not detected above the screening level/MDL of 4.0 µg/L in groundwater samples from TAV-MW15 and TAV-MW16. For the second time in six sampling events (since December 2014), perchlorate was detected above the screening level/MDL of 4.0 µg/L in the CYN-MW15 groundwater sample at a concentration of 4.07 µg/L. SNL/NM personnel requested GEL verify results using a different analytical method, specifically EPA Method 6850 (EPA 1986). Perchlorate was reported in verification samples at 3.19 µg/L in the groundwater sample.

As shown on Figure II-2, the April 2017 perchlorate concentrations reported for monitoring well CYN-MW15 is just above the perchlorate screening level/MDL of 4.0 µg/L. The hydrograph for monitoring well CYN-MW15 (Figure II-2) shows that the water table elevation has been steadily declining over the past year.

Table II-5 summarizes the stabilized water quality values measured immediately before the groundwater samples were collected. The field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

The analytical data were reviewed and validated in accordance with Administrative Operating Procedure 00-03, “Data Validation Procedure for Chemical and Radiochemical Data,” Revision 5 (SNL/NM June 2017b). No problems were identified with the analytical data that resulted in qualification of the data as unusable. The data are acceptable, and reported QC measures are adequate. Appendix B provides the data validation sample findings summary sheets for the perchlorate data.

No variances or nonconformances in perchlorate sampling field activities, or field conditions from requirements in the groundwater monitoring Mini-SAPs (SNL/NM March 2017 and SNL/NM April 2017), were identified during the second quarter of CY 2017 sampling activities.

5.0 **Summary and Conclusions**

Based on analytical data presented in Table II-4 and in previous reports, the following statements can be made:

- The perchlorate concentration for monitoring well CYN-MW15 for the Second Quarter of CY 2017 sampling event was 4.07 µg/L, which is the second detection of perchlorate at this well (Figure II-2). However, these results were not unexpected as CYN-MW15 was installed to replace CYN-MW6, a well with historical perchlorate detections that ranged up to 8.93 µg/L.
- Since June 2004 (the start of sampling as required by the Consent Order), perchlorate was detected above the screening level/MDL (4 µg/L) in groundwater samples from only one well (CYN-MW6) and its replacement well (CYN-MW15) in the perchlorate screening monitoring well network.

- No perchlorate was detected in groundwater samples from monitoring wells TAV-MW15 and TAV-MW16.
- DOE/NNSA and SNL/NM personnel will continue semiannual monitoring of perchlorate for monitoring well CYN-MW15, and quarterly monitoring of perchlorate for monitoring wells TAV-MW15 and TAV-MW16.

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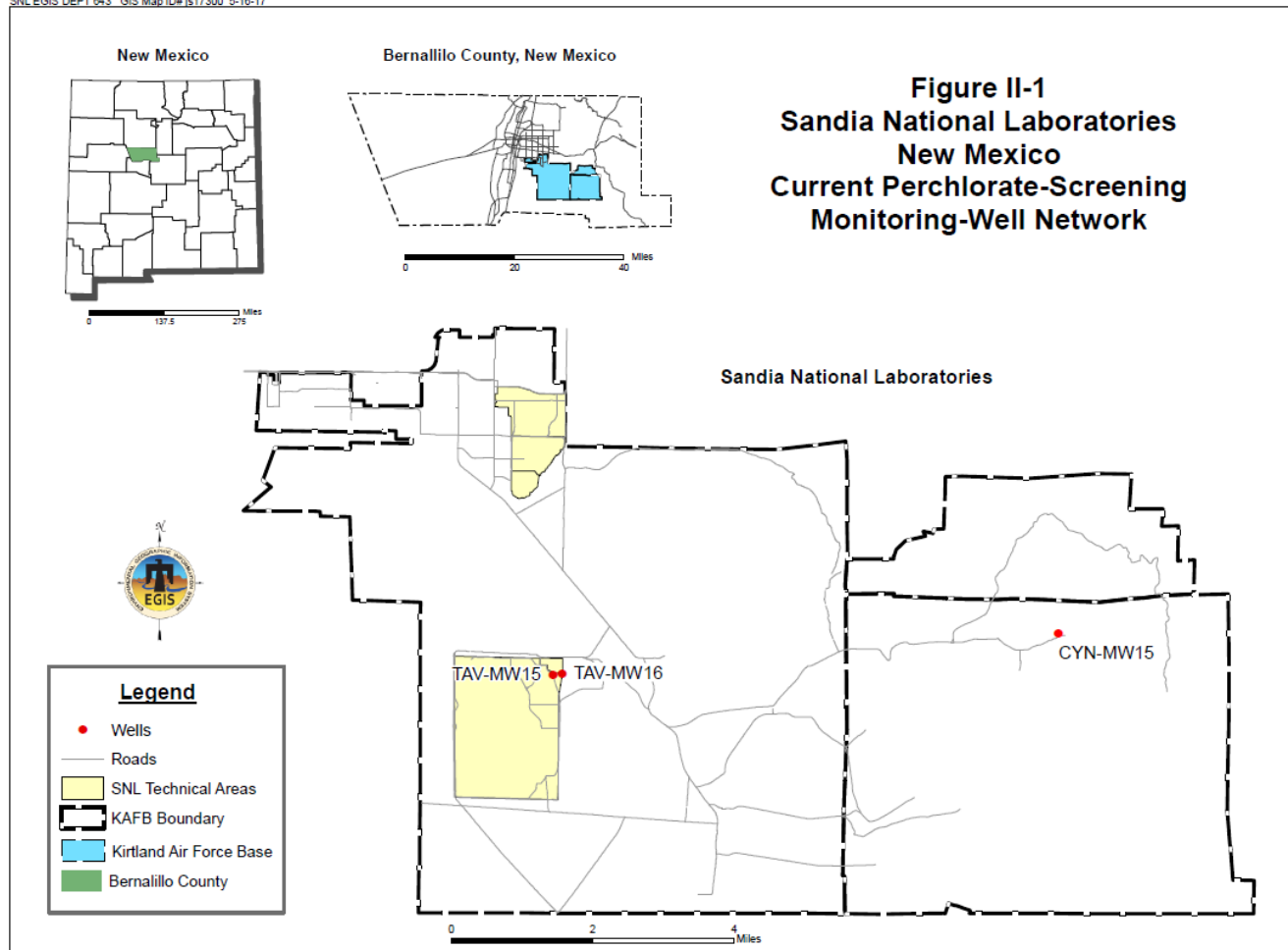
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Figures



Sandia National Laboratories, New Mexico
 Environmental Geographic Information System

New Mexico State Plane Central Zones, 1983
 1988 North American Vertical Datum

Figure II-1
Sandia National Laboratories, New Mexico
Current Perchlorate Screening Monitoring Well Network, April – June 2017

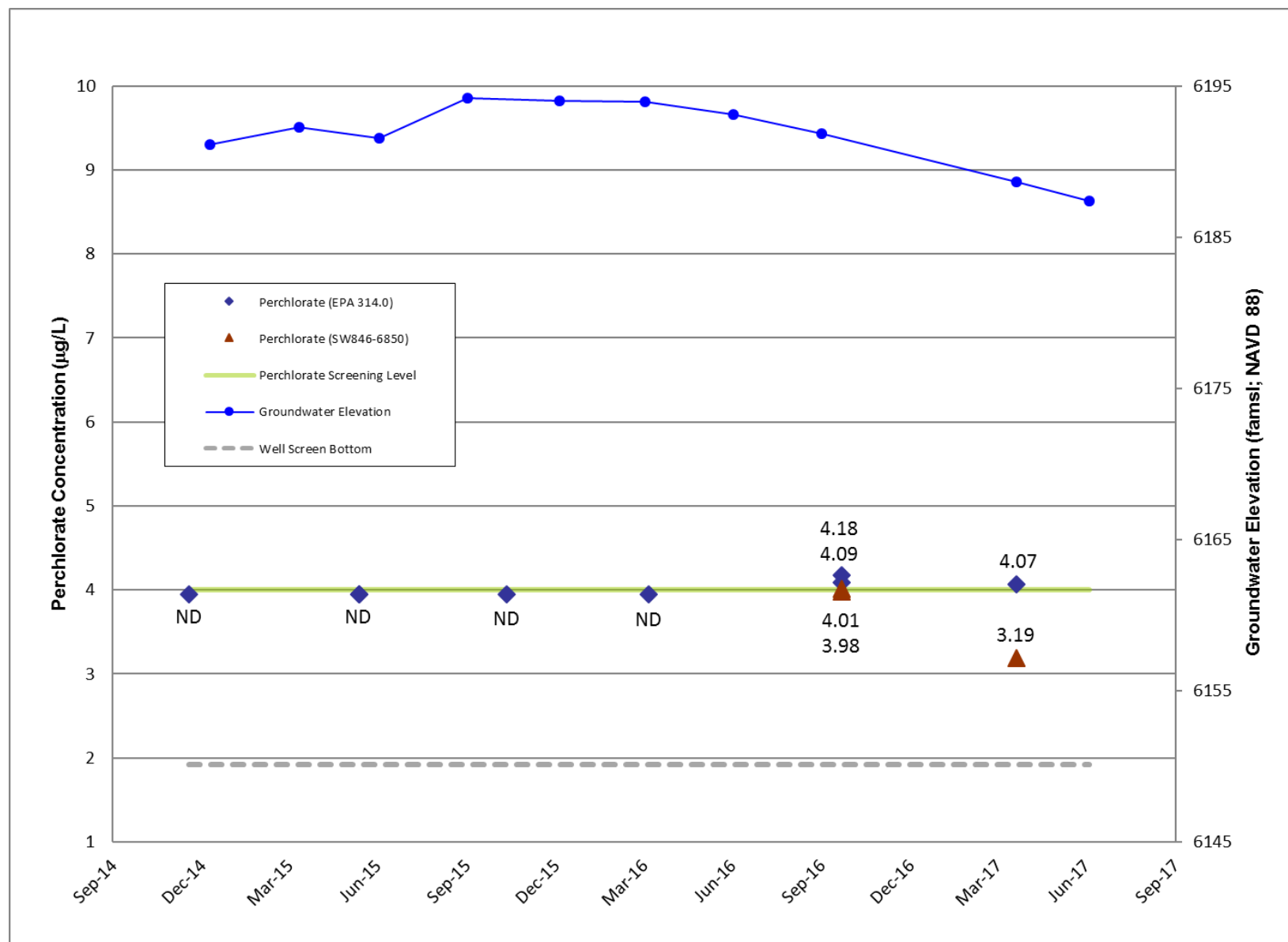


Figure II-2
Groundwater Elevations and Perchlorate Concentrations over Time in CYN-MW15

Tables

Table II-1
Current Perchlorate Screening Monitoring Well Network
Second Quarter, CY 2017

Well	Date Sampled	Number of Consecutive Sampling Events ^a	Remaining Number of Sampling Events	Sampling Equipment
CYN-MW15	19-Apr-17	6	TBD ^b	Bennett™ Pump
TAV-MW15	22-May-17	2	2	Bennett™ Pump
TAV-MW16	24-May-17	2	2	Bennett™ Pump

Notes

^aIncludes this sampling event.

^bThis well was installed as a replacement well for CYN-MW6. Because perchlorate concentrations in CYN-MW6 have exceeded the screening level/MDL, DOE/Sandia, and the NMED have agreed to further characterization requirements in the Burn Site Groundwater Area of Concern (NMED February 2010).

CY = Calendar Year.
CYN = Canyons (Burn Site Groundwater Area of Concern).
DOE = U.S. Department of Energy.
MDL = method detection limit.
MW = monitoring well.
NMED = New Mexico Environment Department.
TAV = Technical Area-V.
TBD = to be determined.

Table II-2
Monitoring Wells Discussed in Previous Perchlorate Screening Reports

Well
CCBA-MW1
CCBA-MW2
CTF-MW1
CTF-MW2
CTF-MW3
CYN-MW1D
CYN-MW5
CYN-MW6
CYN-MW7
CYN-MW8
CYN-MW9
CYN-MW10
CYN-MW11
CYN-MW12
CYN-MW14A
LWDS-MW1
MRN-2
MRN-3D
MWL-BW1
MWL-BW2
MWL-MW1
MWL-MW7
MWL-MW8
MWL-MW9
NWTA3-MW2
OBS-MW1
OBS-MW2
OBS-MW3
SWTA3-MW4
TA1-W-03
TA1-W-06
TA1-W-08
TA2-W-01
TA2-W-27
TAV-MW11
TAV-MW12
TAV-MW13
TAV-MW14

Notes

BW = background well.
 CCBA = Coyote Canyon Blast Area.
 CTF = Coyote Test Field.
 CYN = Canyons (Burn Site Groundwater Area of Concern).
 LWDS = liquid waste disposal system.
 MRN = Magazine Road North.
 MW = monitoring well.
 MWL = Mixed Waste Landfill.
 NWTA = Northwest Technical Area (-III).
 OBS = Old Burn Site.
 SWTA = Southwest Technical Area (-III).
 TA1-W = Technical Area-I (Well).
 TA2-W = Technical Area-II (Well).
 TAV = Technical Area-V.

Table II-3
Sample Details for Second Quarter, CY 2017 Perchlorate Sampling

Well	Sample Identification	AR/COC Number	Associated Groundwater Investigation
CYN-MW15	102400-013	617823	BSG AOC
TAV-MW15	102711-003	617920	TAVG AOC
TAV-MW16	102715-003	617922	
	102716-003		

Notes

AOC = Area of Concern.
 AR/COC = Analysis Request/Chain-of-Custody.
 BSG = Burn Site Groundwater.
 CY = Calendar Year.
 CYN = Canyons (Burn Site Groundwater Area of Concern).
 MW = monitoring well.
 TAV = Technical Area-V.
 TAVG = Technical Area-V Groundwater (Area of Concern).

Table II-4
Summary of Perchlorate Screening Analytical Results for the
Current Monitoring Well Network as of Second Quarter, CY 2017

Well	Sample Date	AR/COC Number	Sample Number	Result (µg/L)	MDL (µg/L)	PQL (µg/L)	MCL (µg/L)	Laboratory Qualifier ^a	Validation Qualifier ^b	Analytical Method ^c	Comments
Burn Site Groundwater Area of Concern											
CYN-MW15	17-Dec-14	615941	096979-020	ND	4.0	12	NE	U		EPA 314.0	
	11-Jun-15	616178	097842-020	ND	4.0	12	NE	U		EPA 314.0	
			097843-020	ND	4.0	12	NE	U		EPA 314.0	Duplicate sample
	10-Nov-15	616396	098486-020	ND	4.0	12	NE	U		EPA 314.0	
	05-Apr-16	616862	099139-008	ND	4.0	12	NE	U		EPA 314.0	
	21-Oct-16	617385	100705-004	4.09	4.0	12	NE	J		EPA 314.0	
			100705-R04	3.98	0.25	1	NE			SW846 6850	
			100706-004	4.18	4.0	12	NE	J		EPA 314.0	Duplicate sample
			100706-R04	4.01	0.25	1	NE			SW846 6850	Duplicate sample
	19-Apr-17	617823	102400-013	4.07	4.0	12	NE	J		EPA 314.0	
102400-R13			3.19	0.1	0.4	NE	Hh	J-	SW846 6850		
Technical Area-V Groundwater Area of Concern											
TAV-MW15	15-Feb-17	617667	101786-003	ND	4.0	12	NE	U		EPA 314.0	
	22-May-17	617920	102711-003	ND	4.0	12	NE	U		EPA 314.0	
TAV-MW16	16-Feb-17	617668	101788-003	ND	4.0	12	NE	U		EPA 314.0	
	24-May-17	617922	102715-003	ND	4.0	12	NE	U		EPA 314.0	
			102716-003	ND	4.0	12	NE	U		EPA 314.0	Duplicate sample

Notes

^aLaboratory Qualifier

If cell is blank, then all quality control samples meet acceptance criteria with respect to submitted samples and no qualifier was assigned.

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

U = Analyte is absent or below the method detection limit.

H = Analytical holding time was exceeded.

h = Prep holding time exceeded.

^bValidation Qualifier

If cell is blank, then all quality control samples meet acceptance criteria with respect to submitted samples and no qualifier was assigned.

J- = The associated numerical value is an estimated quantity with a suspected negative bias.

^cAnalytical Method

EPA 314.0: EPA, November 1999, "Perchlorate in Drinking Water Using Ion Chromatography," EPA 815/R-00-014 (EPA November 1999).

SW846 6850 EPA, 1986 (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., EPA, Washington, D.C.

µg/L = micrograms per liter.

AR/COC = Analysis Request/Chain-of-Custody.

CFR = Code of Federal Regulations.

CY = Calendar Year.

CYN = Canyons (Burn Site Groundwater Area of Concern).

EPA = U.S. Environmental Protection Agency.

Table II-4 (concluded)
Summary of Perchlorate Screening Analytical Results for the
Current Monitoring Well Network as of Second Quarter, CY 2017

Notes

MCL	= maximum contaminant level. Established by the EPA Primary Water Regulations (40 CFR 141.11, Subpart B) and subsequent amendments or Title 20, Chapter 7, Part 1 of the New Mexico Administrative Code, incorporating 40 CFR 141.
MDL	= method detection limit. The minimum concentration that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix-specific.
MW	= monitoring well.
ND	= nondetect (at MDL).
NE	= not established.
PQL	= practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by the indicated method under routine laboratory operating conditions.
TAV	= Technical Area-V.

Table II-5
Perchlorate Screening Groundwater Monitoring
Field Water Quality Measurements^a, Second Quarter, CY 2017

Well	Sample Date	Temperature (°C)	Specific Conductivity (µmhos/cm)	Oxidation-Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
Burn Site Groundwater Area of Concern								
CYN-MW15	19-Apr-17	16.92	1234.0	152.5	7.02	0.52	11.3	1.09
Technical Area-V Groundwater Area of Concern								
TAV-MW15	22-May-17	21.05	773.3	211.8	7.41	1.41	70.1	6.18
TAV-MW16	24-May-17	22.20	875.7	185.9	7.33	0.86	53.0	4.61

Notes

^aField measurements obtained immediately before the groundwater sample was collected.

°C = degrees Celsius.
% Sat = percent saturation.
µmhos/cm = micromhos per centimeter.
CY = Calendar Year.
CYN = Canyons (Burn Site Groundwater Area of Concern).
mg/L = milligrams per liter.
mV = millivolt(s).
MW = monitoring well.
NTU = nephelometric turbidity unit.
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration).
TAV = Technical Area-V.

Appendix A

Analytical Laboratory Certificates of
Analysis for the Perchlorate Data

SMO 2012-ARCOC (4-2012)

CONTRACT LABORATORY ANALYSIS REQUEST AND CHAIN OF CUSTODY

AOP 95-16

Internal Lab

Page 1 of 3

Batch No. <i>N/A</i>		SMO Use		AR/COC 617823								
Project Name: BSG		Date Samples Shipped: <i>4/19/17</i>		SMO Authorizations: <i>[Signature]</i>								
Project/Task Manager: Michael Skelly		Carrier/Waybill No: <i>267064</i>		SMO Contact Phone: Wendy Palencia/505-844-3132								
Project/Task Number: 195122.10.11.01		Lab Contact: Edie Kent/843-789-7385		Send Report to SMO: Stephanie Montaño/505.284.2553								
Service Order: CF058-17		Lab Destination: GEL		Contract No.: 1303873								
Tech Area:		Operational Site:		<input type="checkbox"/> Waste Characterization <input type="checkbox"/> RMA <input type="checkbox"/> Released by COC No. <i>G</i> 4° Celsius								
Building:		Room:		Bill to: Sandia National Laboratories (Accounts Payable), P.O. Box 5800, MS-0154 Albuquerque, NM 87185-0154 <i>#20889</i>								
Sample No.	Fraction	Sample Location Detail	Depth (ft)	Date/Time Collected	Sample Matrix	Container Type	Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
✓ 102399	001	CYN FB-3	NA	4/19/17 10:01	DIW	G	3x40 ml	HCl	G	FB	VOC, TCL (SW846-8260B)	<i>035</i>
✓ 102400	001	CYN-MW15	182	4/19/17 10:01	GW	G	3x40 ml	HCl	G	SA	VOC, TCL (SW846-8260B)	<i>036</i>
✓ 102400	002	CYN-MW15	182	4/19/17 10:02	GW	AG	3x40 ml	NONE	G	SA	TPH-GRO (SW846-8015)	<i>037</i>
✓ 102400	003	CYN-MW15	182	4/19/17 10:03	GW	AG	4x1 L	NONE	G	SA	TPH-DRO (SW846-8015)	<i>038</i>
✓ 102400	004	CYN-MW15	182	4/19/17 10:06	GW	P	125 ml	H2SO4	G	SA	NPN (EPA 353.2)	<i>039</i>
✓ 102400	005	CYN-MW15	182	4/19/17 10:07	GW	P	125 ml	None	G	SA	ANIONS-Br, Cl, F, SO4 (SW846-9056)	<i>040</i>
✓ 102400	006	CYN-MW15	182	4/19/17 10:08	GW	P	500 ml	None	G	SA	AK TOT as CaCO3, HCO3-, and CO3-2 (SM2320B)	<i>041</i>
✓ 102400	007	CYN-MW15	182	4/19/17 10:10	GW	P	500 ml	HNO3	G	SA	METALS, TAL (SW846-6020/7470)	<i>042</i>
✓ 102400	008	CYN-MW15	182	4/19/17 10:11	GW	AG	4x1 L	None	G	SA	HE (SW846-8330B LC/MS/MS)	<i>043</i>
✓ 102400	009	CYN-MW15	182	4/19/17 10:13	GW	P	1 L	HNO3	G	SA	GAMMA SPEC, SHORT LIST (EPA 901)	<i>044</i>
Last Chain: <input type="checkbox"/> Yes		Sample Tracking		SMO Use		Special Instructions/QC Requirements:		Conditions on Receipt				
Validation Req'd: <input checked="" type="checkbox"/> Yes		Date Entered:		EDD <input checked="" type="checkbox"/> Yes		Turnaround Time <input type="checkbox"/> 7-Day* <input type="checkbox"/> 15-Day* <input checked="" type="checkbox"/> 30-Day		Negotiated TAT <input type="checkbox"/> Sample Disposal <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Disposal by Lab Return Samples By: Comments: If perchlorate detected, then request verification analysis using method SW846-6850.				
Background: <input type="checkbox"/> Yes		Entered by:		Negotiated TAT <input type="checkbox"/>								
Confirmatory: <input type="checkbox"/> Yes		QC in's										
Sample Team Members		Name		Signature		Init				Company/Organization/Phone/Cell		
		Robert Lynch		<i>[Signature]</i>		<i>RL</i>		SNL/04141/505-844-4013/505-250-7090				
		William Gibson		<i>[Signature]</i>		<i>WG</i>		SNL/04141/505-239-7367/505-239-7367				
		Alfred Santillanes		<i>[Signature]</i>		<i>AS</i>		SNL/04141/505-284-6870/505-228-0710				
Relinquished by <i>[Signature]</i>		Org. <i>5/1/17</i>		Date <i>4/19/17</i>		Time <i>11:00</i>		Relinquished by				
Received by <i>[Signature]</i>		Org. <i>5/1/17</i>		Date <i>4/19/17</i>		Time <i>11:00</i>		Received by				
Relinquished by <i>[Signature]</i>		Org. <i>5/1/17</i>		Date <i>4/19/17</i>		Time <i>12:15</i>		Relinquished by				
Received by <i>[Signature]</i>		Org. <i>5/1/17</i>		Date <i>4-20-17</i>		Time <i>7:40</i>		Received by				

*Prior confirmation with SMO required for 7 and 15 day TAT

**CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)**

Page 2 of 3

AR/COC 617823

[illegible]

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: May 17, 2017

Company : Sandia National Laboratories
Address : 1515 Eubank SE,ORG 4142
BLDG. 1090/120, MS 1103
Albuquerque, New Mexico 87123
Contact: Ms. Wendy Palencia
Project: Groundwater, Level C Package

Client Sample ID: 102400-013
Sample ID: 420889048
Matrix: AQUEOUS
Collect Date: 19-APR-17 10:09
Receive Date: 20-APR-17
Collector: Client

Project: SNLSGWater
Client ID: SNLS004
Client Desc.: CYN-MW15
Vol. Recv.:

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
EPA 314.0 Perchlorate by IC "As Received"												
Perchlorate	J	0.00407	0.004	0.012	mg/L		1	MAR1	05/13/17	2055	1658783	1
The following Analytical Methods were performed:												
Method	Description		Analyst Comments									
1	EPA 314.0 DOE-AL											

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lo/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 7, 2017

Company : Sandia National Laboratories
Address : 1515 Eubank SE, ORG 4142
BLDG. 1090/120, MS 1103
Albuquerque, New Mexico 87123
Contact: Ms. Wendy Palencia
Project: Groundwater, Level C Package

Client Sample ID: 102400-013
Sample ID: 423532001
Matrix: AQUEOUS
Collect Date: 19-APR-17 10:09
Receive Date: 20-APR-17
Collector: Client

Project: SNLSGWater
Client ID: SNLS004

Client Desc.: CYN-MW15
Vol. Recv.:

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
LC-MS/MS Perchlorate												
Perchlorate by LC-MS/MS "As Received"												
Perchlorate	Hh	3.19	0.100	0.400	ug/L	1.00	2	GXC1	05/23/17	2222	1667580	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 6850 Modified	EPA 6850 Perchlorate Extraction in Liquid	GXC1	05/23/17	1130	1667579

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 6850 Modified	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

SMO 2012-ARCOC (4-2012)

CONTRACT LABORATORY ANALYSIS REQUEST AND CHAIN OF CUSTODY

AOP 95-16

Page 1 of 2

Internal Lab		Batch No. <i>11A</i>		SMO Use		AR/COC		617920				
Project Name: ER TAV GWM		Date Samples Shipped: <i>5/22/17</i>		SMO Authorization: <i>TO-56</i>		<input type="checkbox"/> Waste Characterization						
Project/Task Manager: Jun Li		Carrier/Waybill No. <i>265621</i>		SMO Contact Phone: <i>SMO</i>		<input type="checkbox"/> RMA						
Project/Task Number: 176092.01.10		Lab Contact: Edie Kent/843-769-7385		Wendy Palencia/505-844-3132		<input type="checkbox"/> Released by COC No.		<input checked="" type="checkbox"/> 4° Celsius				
Service Order: CF550-17		Lab Destination: GEL		Send Report to SMO:								
		Contract No.: 1303873		Stephanie Montaño/505.284.2553								
Tech Area:		Room:		Operational Site:		Bill to: Sandia National Laboratories (Accounts Payable),						
Building:						P.O. Box 5800, MS-0154						
						Albuquerque, NM 87185-0154						
Sample No.	Fraction	Sample Location Detail	Depth (ft)	Date/Time Collected	Sample Matrix	Container Type	Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
102710	001	TAV FB-1	NA	5/22/17 10:23	DIW	G	3x40 ml	HCl	G	FB	VOC, TCL (SW846-8260B)	<i>423788</i> <i>001</i>
102711	001	TAV-MW15	540	5/22/17 10:23	GW	G	3x40 ml	HCl	G	SA	VOC, TCL (SW846-8260B)	<i>002</i>
102711	002	TAV-MW15	540	5/22/17 10:24	GW	P	125 ml	H2SO4	G	SA	NPN (EPA 353.2)	<i>003</i>
102711	003	TAV-MW15	540	5/22/17 10:25	GW	P	250 ml	None	G	SA	PERCHLORATE (EPA 314.0)	<i>004</i>
102711	004	TAV-MW15	540	5/22/17 10:26	GW	P	500 ml	HNO3	G	SA	METALS, TAL + TOTAL-U (SW846-6010/6020/7470)	<i>005</i>
102711	005	TAV-MW15	540	5/22/17 10:27	FGW	P	500 ml	HNO3	G	SA	METALS (SW846-6020): As, Fe, Mn	<i>423790</i> <i>001</i>
102711	006	TAV-MW15	540	5/22/17 10:28	GW	P	125 ml	None	G	SA	ANIONS-Br, Cl, F, SO4 (EPA 300.0)	<i>423788</i> <i>006</i>
102711	007	TAV-MW15	540	5/22/17 10:29	GW	P	500 ml	None	G	SA	Alk TOT as CaCO3, HCO3-, and CO3-2 (SM2320B)	<i>007</i>
102711	008	TAV-MW15	540	5/22/17 10:30	GW	P	1 L	HNO3	G	SA	GAMMA SPEC, SHORT LIST (EPA 901)	<i>008</i>
102711	009	TAV-MW15	540	5/22/17 10:32	GW	P	1 L	HNO3	G	SA	GROSS-ALPHA/BETA (EPA 900)	<i>009</i>
Last Chain: <input type="checkbox"/> Yes		Sample Tracking		SMO Use		Special Instructions/QC Requirements:				Conditions on Receipt		
Validation Req'd: <input checked="" type="checkbox"/> Yes		Date Entered:				EDD <input checked="" type="checkbox"/> Yes						
Background: <input type="checkbox"/> Yes		Entered by:				Turnaround Time <input type="checkbox"/> 7-Day* <input type="checkbox"/> 15-Day* <input checked="" type="checkbox"/> 30-Day						
Confirmatory: <input type="checkbox"/> Yes		QC inits:				Negotiated TAT <input type="checkbox"/>						
Sample Team Members	Name	Signature	Init.	Company/Organization/Phone/Cell		Sample Disposal <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Disposal by Lab				Lab Use		
	Robert Lynch	<i>Ralt Lynch</i>	<i>RL</i>	SNL/00641/505-844-4013/505-250-7090		Return Samples By:						
	Alfred Santillanes	<i>Alfred Santillanes</i>	<i>AS</i>	SNL/00641/505-284-6870/505-228-0710		Comments: If perchlorate detected, then request verification analysis using method SW846-6850.						
Relinquished by <i>Alfred Santillanes</i>		Org. <i>0641</i>	Date <i>5/23/17</i>	Time <i>10:51</i>	Relinquished by <i>T. J. Lynch</i>		Org. <i>00631</i>	Date <i>5/23/17</i>	Time <i>12:20</i>			
Received by <i>T. J. Lynch</i>		Org. <i>0631</i>	Date <i>5/23/17</i>	Time <i>10:51</i>	Received by <i>T. J. Lynch</i>		Org.	Date <i>5/23/17</i>	Time <i>7:40</i>			
Relinquished by <i>T. J. Lynch</i>		Org. <i>0631</i>	Date <i>5/22/17</i>	Time <i>11:04</i>	Relinquished by		Org.	Date	Time			
Received by <i>T. J. Lynch</i>		Org. <i>0631</i>	Date <i>5/22/17</i>	Time <i>11:08</i>	Received by		Org.	Date	Time			

*Prior confirmation with SMO required for 7 and 15 day TAT

**CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)**

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AR/COC 617920

[illegible]

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 19, 2017

Company : Sandia National Laboratories
Address : 1515 Eubank SE, ORG 4142
BLDG. 1090/120, MS 1103
Albuquerque, New Mexico 87123
Contact: Ms. Wendy Palencia
Project: Groundwater, Level C Package

Client Sample ID: 102711-003
Sample ID: 423788004
Matrix: AQUEOUS
Collect Date: 22-MAY-17 10:25
Receive Date: 23-MAY-17
Collector: Client

Project: SNLSGWater
Client ID: SNLS004

Client Desc.: TAV-MW15
Vol. Recv.:

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
EPA 314.0 Perchlorate by IC "As Received"												
Perchlorate	U	ND	0.004	0.012	mg/L		1	MARI	06/12/17	2246	1669891	1
The following Analytical Methods were performed:												
Method	Description		Analyst Comments									
1	EPA 314.0 DOE-AL											

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

CONTRACT LABORATORY ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Page 1 of 2

Batch No.		SMO Use		AR/COC		617922						
Project Name: ER TAV GWM		Date Samples Shipped: 5/24/17		SMO Authorization: [Signature]		<input type="checkbox"/> Waste Characterization <input type="checkbox"/> RMA <input type="checkbox"/> Released by COC No. <input checked="" type="checkbox"/> 4° Celsius						
Project/Task Manager: Jun Li		Carrier/Waybill No. 265766		SMO Contact Phone: Wendy Palencia/505-844-3132								
Project/Task Number: 176092.01.10		Lab Contact: Edie Kent/843-769-7385		Send Report to SMO:								
Service Order: CF550-17		Lab Destination: GEL		Stephanie Montaño/505.284.2553								
Contract No.: 1303873						Bill to: Sandia National Laboratories (Accounts Payable), P.O. Box 5800, MS-0154 Albuquerque, NM 87185-0154						
Tech Area:		Room:		Operational Site:								
Sample No.	Fraction	Sample Location Detail	Depth (ft)	Date/Time Collected	Sample Matrix	Container Type	Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
102715	001	TAV-MW16	551	5/24/17 10:33	GW	G	3x40 ml	HCl	G	SA	VOC, TCL (SW846-8260B)	423788 012
102715	002	TAV-MW16	551	5/24/17 10:34	GW	P	125 ml	H2SO4	G	SA	NPN (EPA 353.2)	013
102715	003	TAV-MW16	551	5/24/17 10:35	GW	P	250 ml	None	G	SA	PERCHLORATE (EPA 314.0)	014
102715	004	TAV-MW16	551	5/24/17 10:36	GW	P	500 ml	HNO3	G	SA	METALS, TAL + TOTAL-U (SW846-6010/6020/7470)	015
102715	005	TAV-MW16	551	5/24/17 10:38	FGW	P	500 ml	HNO3	G	SA	METALS (SW846-6020): As, Fe, Mn	423790 002
102715	006	TAV-MW16	551	5/24/17 10:39	GW	P	125 ml	None	G	SA	ANIONS-Br, Cl, F, SO4 (EPA 300.0)	423788 016
102715	007	TAV-MW16	551	5/24/17 10:40	GW	P	500 ml	None	G	SA	Alk TOT as CaCO3, HCO3-, and CO3-2 (SM2320B)	017
102715	008	TAV-MW16	551	5/24/17 10:41	GW	P	1 L	HNO3	G	SA	GAMMA SPEC, SHORT LIST (EPA 901)	018
102715	009	TAV-MW16	551	5/24/17 10:43	GW	P	1 L	HNO3	G	SA	GROSS-ALPHA/BETA (EPA 900)	019
102715	010	TAV-MW16	551	5/24/17 10:44	GW	AG	250 ml	NONE	G	SA	TRITIUM (EPA 906)	020
Last Chain: <input type="checkbox"/> Yes		Sample Tracking		SMO Use		Special Instructions/QC Requirements:				Conditions on Receipt		
Validation Req'd: <input checked="" type="checkbox"/> Yes		Date Entered:				EDD <input checked="" type="checkbox"/> Yes						
Background: <input type="checkbox"/> Yes		Entered by:				Turnaround Time <input type="checkbox"/> 7-Day* <input type="checkbox"/> 15-Day* <input checked="" type="checkbox"/> 30-Day						
Confirmatory: <input type="checkbox"/> Yes		QC inits.:				Negotiated TAT <input type="checkbox"/>						
Sample Team Members	Name	Signature	Init.	Company/Organization/Phone/Cell		Sample Disposal <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Disposal by Lab				Lab Use		
	Robert Lynch	[Signature]	RL	SNL/00641/505-844-4013/505-250-7090		Return Samples By:						
	Alfred Santillanes	[Signature]	AS	SNL/00641/505-284-6870/505-228-0710		Comments: If perchlorate detected, then request verification analysis using method SW846-6850.						
	Gilbert Quintana	[Signature]	GQ	SNL/00641/505-844-2507/505-228-2606								
Relinquished by [Signature]		Org. 00641	Date 5/24/17	Time 11:10	Relinquished by		Org.	Date	Time			
Received by [Signature]		Org. 00631	Date 5/24/17	Time 11:10	Received by		Org.	Date	Time			
Relinquished by [Signature]		Org. 00631	Date 5/24/17	Time 11:55	Relinquished by		Org.	Date	Time			
Received by [Signature]		Org.	Date 5-25-17	Time 7:45	Received by		Org.	Date	Time			

*Prior confirmation with SMO required for 7 and 15 day TAT

**CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)**

Page 2 of 2

AR/COC 617922

[illegible]

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: June 19, 2017

Company : Sandia National Laboratories
Address : 1515 Eubank SE, ORG 4142
BLDG. 1090/120, MS 1103
Albuquerque, New Mexico 87123
Contact: Ms. Wendy Palencia
Project: Groundwater, Level C Package

Client Sample ID: 102715-003
Sample ID: 423788014
Matrix: AQUEOUS
Collect Date: 24-MAY-17 10:35
Receive Date: 25-MAY-17
Collector: Client

Project: SNLSGWater
Client ID: SNLS004

Client Desc.: TAV-MW16
Vol. Recv.:

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
EPA 314.0 Perchlorate by IC "As Received"												
Perchlorate	U	ND	0.004	0.012	mg/L		1	MAR1	06/12/17	2349	1669891	1
The following Analytical Methods were performed:												
Method	Description		Analyst Comments									
1	EPA 314.0 DOE-AL											

Notes:

Column headers are defined as follows:

DF: Dilution Factor

DL: Detection Limit

MDA: Minimum Detectable Activity

MDC: Minimum Detectable Concentration

Lc/LC: Critical Level

PF: Prep Factor

RL: Reporting Limit

SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: June 19, 2017

Company : Sandia National Laboratories
Address : 1515 Eubank SE, ORG 4142
BLDG. 1090/120, MS 1103
Albuquerque, New Mexico 87123
Contact: Ms. Wendy Palencia
Project: Groundwater, Level C Package

Client Sample ID: 102716-003
Sample ID: 423788023
Matrix: AQUEOUS
Collect Date: 24-MAY-17 10:35
Receive Date: 25-MAY-17
Collector: Client

Project: SNLSGWater
Client ID: SNLS004
Client Desc.: TAV-MW16
Vol. Recv.:

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
EPA 314.0 Perchlorate by IC "As Received"												
Perchlorate	U	ND	0.004	0.012	mg/L		1	MAR1	06/13/17	0010	1669891	1
The following Analytical Methods were performed:												
Method	Description		Analyst Comments									
1	EPA 314.0 DOE-AL											

Notes:

Column headers are defined as follows:

DF: Dilution Factor

DL: Detection Limit

MDA: Minimum Detectable Activity

MDC: Minimum Detectable Concentration

Lc/LC: Critical Level

PF: Prep Factor

RL: Reporting Limit

SQL: Sample Quantitation Limit

Appendix B

Data Validation Sample Findings

Summary Sheets for the Perchlorate Data



PO Box 21987
Albuquerque, NM 87154
1-888-678-5447
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Memorandum

Date: July 5, 2017
To: File
From: Linda Thal
Subject: LC/MS/MS Organic Data Review and Validation – SNL
Site: BSG
ARCOC: 617823 relog
SDG: 423532
Laboratory: GEL
Project/Task: 195122.10.11.01
Analysis: Perchlorate

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM SMO Procedure AOP 00-03 Rev 5.

Summary

One sample was prepared and analyzed with accepted procedures using method EPA 6850 Mod. (Perchlorate by LCMSMS). All compounds were successfully analyzed. Problems were identified with the data package that resulted in the qualification of data.

1. The sample was analyzed $>1X$ but $\leq 2X$ past the method specified holding time and will be qualified J-,H1.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times

The sample was analyzed within the prescribed holding time and properly preserved except as noted above in the Summary section.

Instrument Tune

The instrument tune was not reported or evaluated.

Calibration

All initial and continuing calibration met QC acceptance criteria.

Reporting Limit Verification

All CRI (low level verification standard) recoveries met QC acceptance criteria. The CRI was at the MDL and not at 2X the MDL.

Interference Check Standard (ICS)

The ICS recovery met QC acceptance criteria.

Blanks

No target analytes were detected in any of the blanks.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The MS/MSD analyses met all QC acceptance criteria except as follows. The parent sample result was >4X the spike amount and the MSD recovery did not meet acceptance criteria. Because the MS recovery met acceptance criteria, the associated sample result will not be qualified based on professional judgment.

Laboratory Control Sample (LCS)

All LCS recoveries met QC acceptance criteria.

Compound Identification

Perchlorate-O(18) was added to all samples, instrument blanks and standards prior to injection. All retention time and recovery criteria were met.

Perchlorate isotope ratios were met for all field and QC samples.

Detection Limits/Dilutions

All detection limits were properly reported and correctly adjusted for dilution. The sample was diluted 2X due to a high amount of target analyte present in the sample.

Other QC

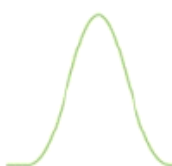
Sample 423532001 was originally analyzed by EPA method 314.0 as sample 420889048. Because the original and confirmation results met precision criteria, the original result is confirmed and no further qualification is necessary based on professional judgment.

No other specific issues that affect data quality were identified.

Reviewed by: Mary Donovan

Level: I

Date: 07/05/17



Sample Findings Summary



AR/COC: 617823

Page 1 of 1

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
SW846 6850 Modified	102400-013/CYN-MW15	Perchlorate (14797-73-0)	J-, H1

All other analyses met QC acceptance criteria; no further data should be qualified.



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Memorandum

Date: July 12, 2017
To: File
From: Linda Thal
Subject: Inorganic Data Review and Validation – SNL
Site: ER TAV GWM
ARCOC: 617920, 617921 and 617922
SDG: 423788
Laboratory: GEL
Project/Task: 176092.01.10
Analysis: General Chemistry

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM SMO Procedure AOP 00-03 Rev 5.

Summary

Three samples were prepared and analyzed with accepted procedures using methods EPA 9056 (anions by IC) and SM 2320B (total alkalinity). Four samples were prepared and analyzed with accepted procedures using methods EPA 353.2 (nitrate/nitrite) and EPA 314.0 (perchlorate). Data were reported for all required analytes. Problems were identified with the data package that resulted in the qualification of data.

Anions:

1. Sample 423788029 was analyzed undiluted; however, the replicate analysis for chloride and sulfate were performed on a sample diluted 20X and considered a dissimilar matrix. The chloride result for sample -029 was a detect and will be qualified J,RP1. The sulfate result for sample -029 was non-detect and will be qualified UJ,RP1.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times and Preservation

The samples were prepared and analyzed within the prescribed holding times and properly preserved.

Calibration

All initial and continuing calibration met QC acceptance criteria.

Blanks

No target analytes were detected in the blanks except as follows. Chloride was detected at < the PQL in the EB, sample -029 associated with sample -016. The chloride result for sample -016 was a detect > the PQL and >5X the EB value and will not be qualified.

Laboratory Control Sample (LCS)

All LCS acceptance criteria were met.

Matrix Spike and Matrix Spike Duplicate (MS/MSD)

All MS/PS recoveries met QC acceptance criteria except as follows. Sample -029 was analyzed undiluted; however, the MS analysis for chloride and sulfate were performed on a sample diluted 20X and considered a dissimilar matrix. Since sample -029 was a field blank and the LCS met QC acceptance criteria for accuracy, no data will be qualified.

Laboratory Replicate

The replicate analyses met all QC acceptance criteria except as noted above in the Summary section.

Detection Limits/Dilutions

All detection limits were properly reported and were correctly adjusted for dilutions.

Anions:

All samples except sample -029 were diluted 20X for chloride and sulfate due to over-range analyte concentrations.

Nitrate/Nitrite:

All samples except sample -026 were diluted 5X due to over-range analyte concentrations.

Other QC

An EB was submitted with ARCO 617921 and was associated with the samples on ARCO 617922. A field duplicate pair for perchlorate and nitrate/nitrite was submitted with ARCO 617922. There are no "required" review criteria for field duplicate analyses comparability; no data will be qualified as a result.

No other specific issues that affect data quality were identified.

Reviewed by: Mary Donovan

Level: I

Date: 07/12/17



Sample Findings Summary



AR/COC: 617920, 617921, 617922

Page 1 of 3

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
EPA 900.0/SW846 9310			
	102711-009/TAV-MW15	BETA (12587-47-2)	J, FR7
	102713-009/TAV EB-1	ALPHA (12587-46-1)	J, FR7
	102713-009/TAV EB-1	BETA (12587-47-2)	BD, FR3
EPA 901.1			
	102711-008/TAV-MW15	Americium-241 (14596-10-2)	BD, FR3
	102711-008/TAV-MW15	Cesium-137 (10045-97-3)	BD, FR3
	102711-008/TAV-MW15	Cobalt-60 (10198-40-0)	BD, FR3
	102711-008/TAV-MW15	Potassium-40 (13966-00-2)	BD, FR3
	102713-008/TAV EB-1	Americium-241 (14596-10-2)	BD, FR3
	102713-008/TAV EB-1	Cesium-137 (10045-97-3)	R, Z2
	102713-008/TAV EB-1	Cobalt-60 (10198-40-0)	BD, FR3
	102713-008/TAV EB-1	Potassium-40 (13966-00-2)	BD, FR3
	102715-008/TAV-MW16	Americium-241 (14596-10-2)	BD, FR3
	102715-008/TAV-MW16	Cesium-137 (10045-97-3)	BD, FR3
	102715-008/TAV-MW16	Cobalt-60 (10198-40-0)	BD, FR3
	102715-008/TAV-MW16	Potassium-40 (13966-00-2)	BD, FR3
EPA 906.0 Modified			
	102711-010/TAV-MW15	Tritium (10028-17-8)	BD, FR3
	102713-010/TAV EB-1	Tritium (10028-17-8)	BD, FR3
	102715-010/TAV-MW16	Tritium (10028-17-8)	BD, FR3
SW846 3005/6020 DOE-AL			
	102711-004/TAV-MW15	Antimony (7440-36-0)	UJ, DL3
	102711-004/TAV-MW15	Arsenic (7440-38-2)	0.005U, B
	102713-004/TAV EB-1	Antimony (7440-36-0)	UJ, DL3
	102715-004/TAV-MW16	Antimony (7440-36-0)	UJ, DL3

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
	102715-004/TAV-MW16	Arsenic (7440-38-2)	0.005U, B
SW846 8260B DOE-AL			
	102710-001/TAV FB-1	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102710-001/TAV FB-1	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102710-001/TAV FB-1	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102710-001/TAV FB-1	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102710-001/TAV FB-1	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102710-001/TAV FB-1	Isopropylbenzene (98-82-8)	UJ, MS5
	102711-001/TAV-MW15	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102711-001/TAV-MW15	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102711-001/TAV-MW15	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102711-001/TAV-MW15	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102711-001/TAV-MW15	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102711-001/TAV-MW15	Isopropylbenzene (98-82-8)	UJ, MS5
	102712-001/TAV TB-1	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102712-001/TAV TB-1	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102712-001/TAV TB-1	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102712-001/TAV TB-1	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102712-001/TAV TB-1	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102712-001/TAV TB-1	Isopropylbenzene (98-82-8)	UJ, MS5
	102713-001/TAV EB-1	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102713-001/TAV EB-1	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102713-001/TAV EB-1	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102713-001/TAV EB-1	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102713-001/TAV EB-1	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102713-001/TAV EB-1	Acetone (67-64-1)	10UJ, B,C2
	102713-001/TAV EB-1	Isopropylbenzene (98-82-8)	UJ, MS5
	102714-001/TAV TB-2	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102714-001/TAV TB-2	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
	102714-001/TAV TB-2	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102714-001/TAV TB-2	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102714-001/TAV TB-2	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102714-001/TAV TB-2	Isopropylbenzene (98-82-8)	UJ, MS5
	102715-001/TAV-MW16	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102715-001/TAV-MW16	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102715-001/TAV-MW16	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102715-001/TAV-MW16	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102715-001/TAV-MW16	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102715-001/TAV-MW16	Isopropylbenzene (98-82-8)	UJ, MS5
	102716-001/TAV-MW16	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102716-001/TAV-MW16	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102716-001/TAV-MW16	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102716-001/TAV-MW16	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102716-001/TAV-MW16	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102716-001/TAV-MW16	Isopropylbenzene (98-82-8)	UJ, MS5
	102717-001/TAV TB-3	1,2,3-Trichlorobenzene (87-61-6)	UJ, MS5
	102717-001/TAV TB-3	1,2,4-Trichlorobenzene (120-82-1)	UJ, MS5
	102717-001/TAV TB-3	1,2-Dichlorobenzene (95-50-1)	UJ, MS5
	102717-001/TAV TB-3	1,3-Dichlorobenzene (541-73-1)	UJ, MS5
	102717-001/TAV TB-3	1,4-Dichlorobenzene (106-46-7)	UJ, MS5
	102717-001/TAV TB-3	Isopropylbenzene (98-82-8)	UJ, MS5
SW846 9056			
	102713-006/TAV EB-1	Chloride (16887-00-6)	J, RP1
	102713-006/TAV EB-1	Sulfate (14808-79-8)	UJ, RP1

All other analyses met QC acceptance criteria; no further data should be qualified.



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Memorandum

Date: June 6, 2017
To: File
From: Linda Thal
Subject: Inorganic Data Review and Validation – SNL
Site: BSG
ARCOC: 617822 and 617827
SDG: 421475
Laboratory: GEL
Project/Task: 195122.10.11.01
Analysis: General Chemistry

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM ER Project AOP 00-03 Rev 4.

Summary

Two samples were prepared and analyzed with accepted procedures using methods EPA 9056 (anions by IC) and SM 2320B (total alkalinity). Three samples were prepared and analyzed with accepted procedures using method EPA 353.2 (nitrate/nitrite). Data were reported for all required analytes. No problems were identified with the data package that resulted in the qualification of data.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times and Preservation

The samples were prepared and analyzed within the prescribed holding times and properly preserved.

Calibration

All initial and continuing calibration met QC acceptance criteria except as follows. The chloride intercept was $>$ the MDL but $\leq 3X$ the MDL and positive for the ICAL associated with sample 421475021. The associated sample result was a detect $> 3X$ the MDL and will not be qualified.

Blanks

No target analytes were detected in the blanks except as follows. Chloride was detected at $>$ the PQL and fluoride at \leq the PQL in EB3, sample 421325005, submitted in another SDG and associated with sample 421475021. The associated sample results were detects $> 5X$ the EB values and will not be qualified.

Laboratory Control Sample (LCS)

All LCS acceptance criteria were met.

Matrix Spike and Matrix Spike Duplicate (MS/MSD)

All MS/MSD and PS recoveries met QC acceptance criteria. It should be noted that the anions PS analysis associated with sample 421475005 was performed on an SNL sample of similar matrix from another SDG. No data will be qualified.

Laboratory Replicate

The replicate analyses met all QC acceptance criteria. It should be noted that the anions replicate analysis associated with sample 421475005 was performed on an SNL sample of similar matrix from another SDG. No data will be qualified.

Detection Limits/Dilutions

All detection limits were properly reported and correctly adjusted for dilutions.

Anions:

Sample 421475005 was diluted 20X and sample -021 was diluted 10X for chloride and sulfate due to over-range analyte concentrations.

Nitrate/Nitrite:

All samples were diluted 100X due to over-range analyte concentrations.

Other QC

An EB was submitted with ARCO 617825, analyzed in another SDG and associated with the samples on ARCO 617827. A field duplicate pair for nitrate/nitrite was submitted with ARCO 617827. There are no "required" review criteria for field duplicate analyses comparability; no data will be qualified as a result.

No other specific issues that affect data quality were identified.

Reviewed by: Mary Donovan Level: I Date: 06/06/17



Sample Findings Summary



AR/COC: 617822, 617827, 617855, 617856

Page 1 of 2

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
DOE EML HASL-300, U-02-RC			
	102394-011/CYN-MW10	Uranium-235/236 (15117-96-1/13982-70-)	J, FR7
	102408-011/CYN-MW13	Uranium-235/236 (15117-96-1/13982-70-)	J, FR7
EPA 900.0/SW846 9310			
	102394-010/CYN-MW10	ALPHA (12587-46-1)	J, FR7
	102394-010/CYN-MW10	BETA (12587-47-2)	J, FR7
	102408-010/CYN-MW13	BETA (12587-47-2)	J, FR7
EPA 901.1			
	102394-009/CYN-MW10	Americium-241 (14596-10-2)	BD, FR3
	102394-009/CYN-MW10	Cesium-137 (10045-97-3)	BD, FR3
	102394-009/CYN-MW10	Cobalt-60 (10198-40-0)	BD, FR3
	102394-009/CYN-MW10	Potassium-40 (13966-00-2)	BD, FR3
	102408-009/CYN-MW13	Americium-241 (14596-10-2)	BD, FR3
	102408-009/CYN-MW13	Cesium-137 (10045-97-3)	BD, FR3
	102408-009/CYN-MW13	Cobalt-60 (10198-40-0)	BD, FR3
	102408-009/CYN-MW13	Potassium-40 (13966-00-2)	BD, FR3
EPA 906.0 Modified			
	102394-012/CYN-MW10	Tritium (10028-17-8)	BD, FR3
	102408-012/CYN-MW13	Tritium (10028-17-8)	BD, FR3
SW846 3005/6020 DOE-AL			
	102408-007/CYN-MW13	Silver (7440-22-4)	0.0024U, B2
SW846 3535A/8330B			
	102394-008/CYN-MW10	m-Nitrotoluene (99-08-1)	UJ, I4
	102394-008/CYN-MW10	Nitrobenzene (98-95-3)	UJ, I4
	102394-008/CYN-MW10	o-Nitrotoluene (88-72-2)	UJ, I4

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
	102394-008/CYN-MW10	p-Nitrotoluene (99-99-0)	UJ, I4
	102408-008/CYN-MW13	m-Nitrotoluene (99-08-1)	UJ, I4
	102408-008/CYN-MW13	Nitrobenzene (98-95-3)	UJ, I4
	102408-008/CYN-MW13	o-Nitrotoluene (88-72-2)	UJ, I4
	102408-008/CYN-MW13	p-Nitrotoluene (99-99-0)	UJ, I4
SW846 8260B DOE-AL			
	102394-001/CYN-MW10	2-Butanone (78-93-3)	UJ, I5
	102394-001/CYN-MW10	Acetone (67-64-1)	UJ, I5
	102395-001/CYN TB-17	2-Butanone (78-93-3)	UJ, I5
	102395-001/CYN TB-17	Acetone (67-64-1)	UJ, I5
	102408-001/CYN-MW13	2-Butanone (78-93-3)	UJ, I5
	102408-001/CYN-MW13	Acetone (67-64-1)	UJ, I5
	102410-001/CYN TB-27	2-Butanone (78-93-3)	UJ, I5
	102410-001/CYN TB-27	Acetone (67-64-1)	UJ, I5
	102456-001/CYN FB-7	2-Butanone (78-93-3)	UJ, I5
	102456-001/CYN FB-7	Acetone (67-64-1)	UJ, I5
	102558-001/CYN-MW11	2-Butanone (78-93-3)	UJ, I5
	102558-001/CYN-MW11	Acetone (67-64-1)	UJ, I5
	102559-001/CYN FB-9	2-Butanone (78-93-3)	UJ, I5
	102559-001/CYN FB-9	Acetone (67-64-1)	UJ, I5
	102560-001/CYN TB-29	2-Butanone (78-93-3)	UJ, I5
	102560-001/CYN TB-29	Acetone (67-64-1)	UJ, I5
	102561-001/CYN-MW12	2-Butanone (78-93-3)	UJ, I5
	102561-001/CYN-MW12	Acetone (67-64-1)	UJ, I5
	102562-001/CYN TB-31	2-Butanone (78-93-3)	UJ, I5
	102562-001/CYN TB-31	Acetone (67-64-1)	UJ, I5

All other analyses met QC acceptance criteria; no further data should be qualified.